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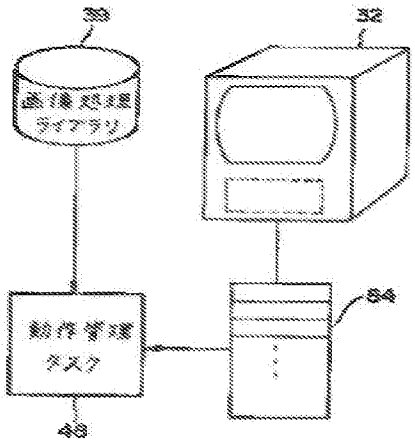
(54) IMAGE RECOGNITION PROGRAM CONSTRUCTING DEVICE AND METHOD THEREFOR

(57)Abstract:
PURPOSE: To provide an image recognition algorithm constructing device which is capable of easily constructing an image recognition algorithm.
CONSTITUTION: A menu display is performed for an image processing sub-routine on a monitor 32 by a menu device. When an operator selects a desired image processing sub-routine, the image processing is temporarily performed and the result is displayed on the monitor 32. When the operator is not satisfied with the result, he cancels the selection. When he is satisfied with the result, he performs a registration. The registration is performed by writing the image processing sub-routine in an image processing memory 84 which is used as a table. By referring to this image processing memory 84 and calling the registered image processing sub-routine from an image processing library 39 by an operation control task 48, an image recognition program executing a desired image processing is realized.



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2.**** shows the word which can not be translated.
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CLAIMS

[Claim(s)]
[Claim 1]In an image recognition program construction device which builds an image recognition program which recognizes a picture by performing two or more Image Processing Division, With a memory measure which memorized two or more Image Processing Division subroutines which perform predetermined Image Processing Division, a displaying means which carries out the menu indication of said Image Processing Division subroutine memorized by said memory measure, and an operator's directions. An image recognition program construction device including a selecting means which chooses a desired subroutine from said menu indication, and a construction means which builds an image recognition program which calls a subroutine with said selected selecting means, and includes execution of this called subroutine.
[Claim 2]In the image recognition program construction device according to claim 1, further said selecting means, An image recognition program construction device, wherein said image recognition program construction means includes a preparing means which creates a main program which carries out sequential execution of the Image Processing Division subroutine registered into said table including a table means by which said selected Image Processing Division subroutine is registered.
[Claim 3]In the image recognition program construction device according to claim 1 or 2, said selecting means, An Image Processing Division result display means to perform Image Processing Division corresponding by performing the selected Image Processing Division subroutine, and to display the processing result, An image recognition program construction device including a selection release means of which selection of said Image Processing Division subroutine as which a processing result was displayed is canceled with an operator's directions.
[Claim 4]In an image recognition program construction method of building an image recognition program which recognizes a picture by performing two or more Image Processing Division, With a preliminary process for which two or more Image Processing Division subroutines which perform predetermined Image Processing Division are prepared, a display process of carrying out the menu indication of said said prepared Image Processing Division subroutine, and an operator's directions. An image recognition program construction method including a selection process which chooses a desired subroutine from said menu indication, and a construction process which builds an image recognition program which calls a subroutine with said selected selection process, and includes execution of this called subroutine.
[Claim 5]In an image recognition program construction method according to claim 4, further said selection process, A table registration process of registering said selected Image Processing Division subroutine into a table, and said image recognition program construction process, An image recognition program construction method including a creation process of creating a main program which carries out sequential execution of the Image Processing Division subroutine registered into said table.
[Claim 6]In an image recognition program construction method according to claim 4 or 5, said selection process, The Image Processing Division result display process of performing Image Processing Division corresponding by performing the selected Image Processing Division subroutine, and displaying the processing result, An image recognition program construction

method including a selection release process that an operator's directions cancel selection of said Image Processing Division subroutine as which a processing result was displayed.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application]This invention relates to the device which recognizes the subject (it is hereafter called a "work") which is a recognition object. It is related with the building device and method of an image recognition program of an optical image recognition device of recognizing a work, by performing predetermined Image Processing Division to the picture of the work obtained by picturizing a work especially.
[0002]
[Description of the Prior Art]Conventionally, in production facilities, such as a car, the optical work recognition device is used for the check of parts having been attached normally, or the inspection. This optical work recognition device applies the art of Image Processing Division, and recognizes the work.
[0003]In a production facility, since production is presented with usually various parts, the above-mentioned work recognition device also needs to recognize such a variety of works. Thus, in order to recognize the work of two or more kinds, invention-in-this-application persons had adopted the following means.
[0004](1) Install two or more image recognition devices incorporating an image recognition algorithm for exclusive use for every work, and choose a suitable device as it according to the target work.
[0005](2) Build said two or more image recognition algorithms into a highly efficient image processing device, and choose an algorithm as it according to the target work.
[0006]In many conventional production facilities, what is called a production instruction device (assembly line control (ALC)) is introduced, and it is always directed on each line what kind of part flows into each factory line (production instruction). In the above (1) which invention-in-this-application persons had adopted, and the device of (2), the suitable image recognition device was chosen according to this production instruction.
[0007]So to speak in the above (1), hardware (image recognition device) was chosen according to the work. To it, I hear that the software used inside the image recognition device of a piece is chosen from two or more candidates, and (2) has it. Although, as for the Image Processing Division speed, the direction where hardware was generally chosen becomes quick, since hardware quantity increases, there is a fault used as an expensive thing. Therefore, in the stage in early stages of a start of production, it is common to adopt the device of (1) by selection of hardware with expansion of a production scale using the device of (2) by selection of software.
[0008]Therefore, it will be necessary to transpose Image Processing Division by software to the picture treatment by hardware. In order to carry out such replacement, based on the design of image processing software, the method of designing the hardware for Image Processing Division is proposed variously. For example, in JP,H3-129475,A, the method of designing hardware is indicated from software based on knowledge data.
[0009]Thus, it is possible by changing the algorithm of Image Processing Division according to each work to conduct the surveillance, inspection, etc. of two or more works.
[0010]As stated above, the conventional image recognition device supported two or more works

by changing hardware or software.
[0011]
[Problem(s) to be Solved by the Invention]The conventional image recognition device was constituted as mentioned above. Therefore, there were the following problems.
[0012](1) While according to the technique provided with the above-mentioned hardware for every work hardware quantity becomes large and cost becomes large, the area of installation area also has the problem of becoming large. To change an image recognition algorithm, it is necessary to reinstall the exclusive program which exchanged the whole hardware of each image recognition device, or was designed for every work in each image recognition device. Therefore, there were a routing counter for change and a problem that cost will become large.
[0013]In development of an algorithm, since the special engineer had to perform confirmation work of operation of an algorithm by trial and error, efficient development work was not able to be performed.
[0014](2) It had two or more software, and according to the technique of changing software according to the target work, loading of software took time and there was a problem that execution time will become late.
[0015]Since it was the check of operation of the software which needed to perform development of software through the work of compile etc. from coding of software, and was completed, confirmation work of operation of the software had to be performed by trial and error like the above (1).
[0016]In order to correspond to a new work, also when new software was built, it was not able to change promptly by the check of the operation taking time.
[0017]And since the know how was required for coding of software, and compile, after the image recognition device was introduced into the spot, there was a problem that it was difficult for an on-site preservation person to maintain the device.
[0018]This invention is made in view of an aforementioned problem, and the purpose is to provide the device and method of building for an image recognition algorithm easily.
[0019]
[Means for Solving the Problem]In order to attain the above purposes, this invention, In an image recognition program construction device which builds an image recognition program which recognizes a picture by performing two or more Image Processing Division, With a memory measure which memorized two or more Image Processing Division subroutines which perform predetermined Image Processing Division, a displaying means which carries out the menu indication of said Image Processing Division subroutine memorized by said memory measure, and an operator's directions. A subroutine with a selecting means which chooses a desired subroutine from said menu indication, and said selected selecting means is called, It is an image recognition program construction device including a construction means which builds an image recognition program including execution of this called subroutine.
[0020]To achieve the above objects this invention, In an above image recognition program construction device, further said selecting means, It is an image recognition program construction device including a preparing means which creates a main program which carries out sequential execution of the Image Processing Division subroutine by which said image recognition program construction means was registered into said table including a table means by which said selected Image Processing Division subroutine is registered.
[0021]To achieve the above objects this invention, In an image recognition program construction device of two above-mentioned inventions, said selecting means, An Image Processing Division result display means to perform Image Processing Division corresponding by performing the selected Image Processing Division subroutine, and to display the processing result, It is an image recognition program construction device including a selection release means of which selection of said Image Processing Division subroutine as which a processing result was displayed is canceled with an operator's directions.
[0022]To achieve the above objects this invention, In an image recognition program construction method of building an image recognition program which recognizes a picture by performing two or more Image Processing Division, With a preliminary process for which two or more Image

Processing Division subroutines which perform predetermined Image Processing Division are prepared, a display process of carrying out the menu indication of said said prepared Image Processing Division subroutine, and an operator's directions. A subroutine with a selection process which chooses a desired subroutine from said menu indication, and said selected selection process is called, It is the image recognition program construction method including a construction process which builds an image recognition program including execution of this called subroutine.

[0023]To achieve the above objects this invention, In an above-mentioned image recognition program construction method, further said selection process, A table registration process of registering said selected Image Processing Division subroutine into a table, and said image recognition program construction process, It is the image recognition program construction method including a creation process of creating a main program which carries out sequential execution of the Image Processing Division subroutine registered into said table.

[0024]To achieve the above objects this invention, In two above-mentioned image recognition program construction methods, said selection process, The Image Processing Division result display process of performing Image Processing Division corresponding by performing the selected Image Processing Division subroutine, and displaying the processing result, It is the image recognition program construction method including a selection release process that an operator's directions cancel selection of said Image Processing Division subroutine as which a processing result was displayed.

[0025]

[Function]The selecting means in this invention chooses a predetermined subroutine with an operator's directions. And an image recognition program construction means builds the image recognition program which calls the selected subroutine. Therefore, even if it does not have know hows, such as coding of a program, and compile, construction of an image recognition program is possible. Since the table means in this invention creates the main program which carries out sequential execution of the subroutine by which the Image Processing Division subroutine was registered and the preparing means was registered into this table means, it can build easily the image recognition program which performs each subroutine.

[0026]The Image Processing Division result display means in this invention displays the executed result of the Image Processing Division subroutine with the selected selecting means. And if an operator is not satisfied with the result, he can cancel selection by a selection release means. Therefore, construction of an image recognition program is possible with slight accuracy in the result of Image Processing Division.

[0027]The selection process in this invention chooses a predetermined subroutine with an operator's directions. And an image recognition program construction process builds the image recognition program which calls the selected subroutine. Therefore, even if it does not have know hows, such as coding of a program, and compile, construction of an image recognition program is possible. In [the table registration process in this invention registers the Image Processing Division subroutine into a table, and] a creation process, Since the main program which carries out sequential execution of the subroutine registered into this table is created, the image recognition program which performs each subroutine can be built easily.

[0028]The Image Processing Division result display process in this invention displays the executed result of the Image Processing Division subroutine selected in the selection process. And selection is canceled by the selection release process if an operator is not satisfied with the result. Therefore, construction of an image recognition program is possible with slight accuracy in the result of Image Processing Division.

[0029]

[Example]Hereafter, suitable working example of this invention is described based on Drawings.

[0030]The entire configuration figure of the wrong/missing part recognition system of the parts (it is hereafter called a "work") using the image recognition device 10 of this example is shown in drawing 1. This system contains the cameras 12a, 12b, 12c, and 12d which photo a work, and the cameras 12a, 12b, and 12c and the lighting systems 14a, 14b, 14c, and 14d formed every 12d as shown in drawing 1. The video signals VIN1-VIN4 which each camera outputted, and the

synchronized signals SYN1-SYN4 are supplied to the image recognition device 10 via the camera switcher 16. This camera switcher 16 contains the synchronizing pulse distribution unit 18 which supplies the synchronized signal of any one ****** for the above-mentioned synchronized signals SYN1-N to the image recognition device 10, and the video-signal switcher 20 which supplies the video signal of any one ****** for the above-mentioned video signals VIN1-N to the image recognition device 10.

[0031]In this example, characteristic composition is the image recognition device 10, and other composition of it is the same as the conventional composition. This image recognition device 10 inputs the picture photoed with the cameras 12a, 12b, 12c, and 12d, by performing predetermined Image Processing Division, is the point of recognizing a work and has the same work as the conventional image recognition device. However, the algorithm which performs this recognition, i.e., an image recognition algorithm, can change Image Processing Division easily included in that image recognition algorithm by an operator's operation so that it may mention later. Therefore, according to this example, even if it does not repeat the coding compile by an expert, it is possible to deal with change of the work which is the target of recognition easily.

[0032]This system contains ALC24 which supplies production instruction information in the various equipment which constitutes a factory line with the wrong/missing part recognition host 22 who judges that the wrong/missing part of the work arose, when a work has not been recognized.

[0033]The image recognition device 10 adjusts an automatic diaphragm of the cameras 12a, 12b, 12c, and 12d via automatic diaphragm Interface Division 28, and adjusts lighting systems [14a, 14b, 14c, and 14d] illumination via illumination control Interface Division 30. And the monitor 32 is connected to the image recognition device 10 in order to control and supervise operation of the image recognition device 10. On this monitor 32, it is possible to choose and register each Image Processing Division which the menu which is the characteristic composition of this invention is displayed, and constitutes an image recognition algorithm with the directions from an operator so that it may mention later.

[0034]On the other hand, the wrong/missing part recognition host 22 controls the camera switcher 16, and changes the video signal and synchronized signal which are supplied to the image recognition device 10.

[0035]In this example, explanation of the image recognition device 10 which is characteristic composition, and explanation about the method of picturizing a work are given by following 1., and explanation by the whole operation of the wrong/missing part recognition system of this example is given by 2.

[0036]1. Image recognition device and method 1.1 of picturizing work The image recognition device 10 in image recognition device this example comprises a processor and software which this processor performs. The composition of the software of the image recognition device 10 is shown in drawing 2. RS232C driver 40 and the DI/DO driver 42 are hardwares which output and input a signal among a figure, and the data module 44 is the memory storage which memorized data. All "tasks" other than these devices is software.

[0037]The image recognition device 10 in this example constitutes the computer which realizes what is called real-time multitasking.

Two or more "tasks" can be performed simultaneously.

However, this invention is realizable also by computer by which real-time multitasking is not realized.

[0038]Refer to the data module 44 for all the tasks shown in drawing 2. That is, in this example, since operation of a task is controlled by setting various values to the data module 44, supple processing is realized. For example, it is possible by setting the number of Image Processing Division as the data module 44 to register Image Processing Division performed on an image recognition algorithm. This registration can be changed when an operator chooses from the menu displayed on the monitor 32. When a new image recognition program compatible with a new work is required, it is also possible to build the new image recognition program which performs desired Image Processing Division by selection.

[0039]And if Image Processing Division with an operator is chosen from the menu on the monitor

32, the Image Processing Division will be carried out temporarily and the result of the Image Processing Division will be displayed on the monitor 32. Therefore, since the operator can check the effect (result) of selected Image Processing Division promptly on the monitor 32, the trial-and-error adjustment by an expert is not needed like before. If the result of this check is satisfying, that Image Processing Division will be registered. Registration is performed by setting the number of the Image Processing Division as the above-mentioned data module. It is also possible to cancel registration if the result of a check is unsatisfying. In this example, it is possible to choose Image Processing Division interactively on the menu screen of the monitor 32 in this way.

[0040]Thus, by registering, it is possible to include desired Image Processing Division in an image recognition algorithm.

[0041]Deletion of Image Processing Division included in the algorithm from before is also performed by canceling registration with the directions from a menu, as mentioned above. Change of an image recognition algorithm or construction of a completely new image recognition algorithm is easily feasible by deleting predetermined Image Processing Division and registering Image Processing Division of a new request into an algorithm.

[0042]It is at this point that it is characteristic in this example. Namely, with change of a work, conventionally, building an image recognition algorithm, combining various Image Processing Division appropriately was not completed, when it was not a fixed expert, but. In this example, desired Image Processing Division is only chosen from the menu, and the image recognition algorithm with which the Image Processing Division was incorporated is built automatically. Therefore, construction of an algorithm is easily possible also for an inexperienced personnel to coding, compile, etc.

[0043]Thus, the example in which an image recognition algorithm is built is explained using drawing 3. The partial lineblock diagram of the wrong/missing part recognition system centering on the image recognition device 10 is shown in drawing 3. The display example of the menu in case selection of a binary-ized method is performed as one of the Image Processing Division is shown in the portion surrounded with the dashed line to which "selection of a binary(example)-ized method" and a title are given among drawing 3.

[0044]First, the following top menus are displayed on the screen of the monitor 32.

[0045]a good-ized binary-ized binary format image good-quality ghost object extraction characteristic quantity Measurement Division judging and collation of a treatment area limited shade image -- such seven items are shown in the top menu. The item of this top menu is shown in the left-hand side of the portion of the dashed line shown by "selection of a binary (example)-ized method" of drawing 3. An operator chooses the item of "binary-izing" from a top menu to choose Image Processing Division of binary-izing, for example.

[0046]Then, the menu of a medium is displayed on the screen of the monitor 32. There, each class at the time of roughly dividing processing of binary-izing into two kinds is displayed. In this example, the item displayed as these classes is as follows.

The operator chose "automatic binary-ization" now [fixed binary-ized automatic binary-ized] corresponding to the work. Then, the lower layer menu in which the binarization processing classified into the class of the formation of an automatic binary is shown as an item is shown on the monitor 32. Each item included in the menu of imagination is as follows.

[0047]MAX and a MIN binary -- in-izing least-mean-square-approximation binary-ized constant area binary-ized histogram binary-ized floating binary-ized this example, only the thing of two kinds of concentration of a work and its background is displayed on the screen photoed by the cameras 12a-12d, for example. Since the operator knows this beforehand, it expects that the luminosity on the photoed screen is roughly divided into two groups. Therefore, in this case, an operator thinks that he will classify the luminance value by a histogram, and chooses upper "histogram binary-ization." "Histogram binary-ization" is the method of building the histogram of the luminance value on a screen and carrying out binary-ization based on the tendency of a histogram.

[0048]If desired Image Processing Division is chosen as mentioned above, the result of having carried out the Image Processing Division immediately will be displayed on the monitor 32.

Therefore, an operator will register the Image Processing Division task of this "formation of a histogram binary" into an image recognition algorithm as it is, if satisfied with the result of that Image Processing Division. When not satisfied with a result, selection from a top menu will be repeated again.

[0049]Since an interactive response with an operator can be repeated in this way and Image Processing Division can be made to choose it as an operator, the image recognition device 10 in this example can be easily performed, even if construction of the image recognition program which performs the selected Image Processing Division task is not an expert.

[0050]According to this example as mentioned above, the thing for which it only chooses from a menu and desired Image Processing Division is included in an algorithm (registration) and to do is possible. Therefore, construction of the image recognition algorithm with which the expert was performing coding compile from the beginning whenever change arose to the work conventionally can carry out very easily.

[0051]Thus, the example of the image recognition algorithm built by selection is shown in the portion surrounded with the "creation (example) algorithm" and the dashed line to which the title was given among drawing 3. The image recognition algorithm shown here is an image recognition algorithm in case a work is a "resin label", for example. And "the resin label (algorithm No.1)" and the title are attached and shown in the left-hand side of the portion on which this image recognition algorithm was shown with the dashed line. the image recognition algorithm of this "resin label" -- "image taking" and a "window set" -- it is an algorithm which Image Processing Division is performed in ... and order, and execution ends by Image Processing Division of "left end object extraction", "characteristic quantity Measurement Division", and "a judgment."

[0052]The image recognition device 10 in this example can memorize two or more image recognition algorithms. That is, it is possible to store two or more algorithms in the above-mentioned data module 44.

[0053]And the image recognition algorithm corresponding to a work is used in the image recognition device 10 by the directions information from the wrong/missing part recognition host 22 so that it may mention later.

[0054]Although the candidate of Image Processing Division which is the target of selection with a menu makes the Image Processing Division library 39 memorize beforehand, the special expert creates beforehand the program of the Image Processing Division task itself which performs this Image Processing Division in consideration of various situations (coding and compile).

[0055]When the work which should be recognized was changed and not only existing Image Processing Division but completely new Image Processing Division is needed, a special expert creates only the Image Processing Division task, and should just register with the Image Processing Division library 39. By choosing this registered new Image Processing Division from the menu in the monitor 32, the new image processing algorithm for recognizing said work is built. Therefore, when there was change to a work, the whole image recognition algorithm needed to be rewritten conventionally, but since an expert should create only the portion of the required Image Processing Division task according to this example, it has the effect that construction of an image recognition algorithm can carry out very easily and promptly.

[0056]The image recognition device 10 in this example can build an image recognition algorithm easily in this way. In order to understand easily, the partial lineblock diagram of only the portion which builds this algorithm is shown in drawing 4.

[0057]Each Image Processing Division task is memorized to the Image Processing Division library 39 as shown in drawing 4. The monitor 32 contains the menu device 33.

By this menu device, a menu is displayed on the indicator of a monitor.

An operator chooses the predetermined item in a menu, for example with pointing devices, such as a mouse. Then, this menu device 33 registers the selected item into the image processing memory 84. The image processing memory 84 is a predetermined field inside the data module 44. The image processing memory 84 is making table structure.

It is referred by the operation management task 48.

The operation management task 48 carries out sequential execution of each Image Processing Division registered there by referring to the image processing memory 84 which is a table. Thus,

this invention is constituted within the image recognition device 10.
[0058]Operation of this whole image recognition device 10 is explained using drawing 2 and drawing 3. The RS232C receiving task 46 shown in drawing 2 receives directions information, including a number of an image recognition algorithm, binary level data, etc. which were sent out from the wrong/missing part recognition host 22, and the received data is registered into the data module 44. When it is detected that said data was registered into the data module 44, the operation management task 48 shown in drawing 2 starts the initialization task 50 and the control data set task 52, and performs re-memory allocation of the above-mentioned received data. In this example, re-memory allocation means the work of setting each parameter, such as binary level data, to the table for each Image Processing Division tasks based on received data.
[0059]Next, the DI/DO transmission task 54 outputs an illuminance value and a diaphragm value to illumination control Interface Division 30 and automatic diaphragm Interface Division 28. Illumination control Interface Division 30 changes into voltage information the illuminance value sent out by digital value by D/A conversion, and the optimal illuminance value for these is set up by supplying this voltage information to the lighting systems 14a-14d. These automatic diaphragm values are adjusted by automatic diaphragm Interface Division's 28 changing into voltage information the diaphragm value sent out by digital value by D/A conversion, and supplying this voltage information to the cameras 12a-12d. Next, when the DI/DO receiving task 56 receives the recognition start signal sent out from the cameras 12a-12d, this DI/DO receiving task 56 sets a recognition start signal to the data module 44. The operation management task 48 will start the image taking task 58, the Image Processing Division task 60, the judgment task 62, etc., if it detects that the recognition start signal was set to the data module 44. The image taking task 58 and Image Processing Division task 60 grade set each measuring result to the data module 44. And when this measuring result is set to the data module 44, the operation management task 48 starts the judgment task 62, and makes a wrong/missing part judge. The judgment task 62 sets the decision result about whether there is any wrong/missing part to the data module 44 with reference to the data module 44.
[0060]The operation management task 48 is supervising that each task and Image Processing Division are completed by referring to the data in the data module 44. And the operation management task 48 transmits a decision result to the wrong/missing part recognition host 22 by starting transmit data set task 64, RS232C transmission task 66, and DI/DO transmission task 54 and others, after all the tasks and Image Processing Division are completed.
[0061]Since it is possible to make one image processing device equipped with two or more image recognition algorithms and the image recognition algorithm corresponding to the work which is an object of recognition can be chosen by such operation, the high recognition rate of a work is expectable.
[0062]So to speak in this example, "binary-ization of each task", etc. is a unit of Image Processing Division. And since each task is managed by the operation management task 48 via the data module 44 as mentioned above, it can miniaturize each task. As a result, even if it is small processing units, such as a personal computer, it is possible to station permanently all the tasks including the operation management task 48 on the memory. Therefore, useless time, such as doing loading of a program again for every processing, does not arise.
[0063]The flow of detailed operation of this image recognition device 10 is explained based on drawing 5. The flow of each processing is shown by the dashed line in drawing 5.
[0064]In processing of the dashed line first shown by ** in drawing 5, the screen number of the work proceeding number to the work proceeding number of the image recognition work to do, the processing algorithm number of the work proceeding number, and the characteristic quantity algorithm number of a work proceeding number are stored in the schedule management memory 80 now. A screen number is a number which specifies what is called a window in the screen of a piece. This schedule management memory 80 is some data modules 44, and the turn that Image Processing Division is performed is stored.
[0065]The screen number corresponding to the work proceeding number from the wrong/missing part recognition host 22 in these screen numbers, etc. are sent out to the image recognition device 10. The wrong/missing part recognition host 22 searches for the above-mentioned screen

number etc. based on the production instruction information sent out from ALC24, and sends out to the image recognition device 10 so that it may mention later.
[0066]In processing of the dashed line shown by ** in drawing 5, a screen (window) is drawn on the screen of the monitor 32 by the screen coordinate in said screen number.
[0067]In processing of the dashed line shown by ** in drawing 5, Image Processing Division only the number of the use table currently used there was indicated to be with the table number in order of the schedule is performed with reference to the algorithm management memory 82 of an image processing algorithm number. A use table is a table which stored the parameter etc. which are used in each Image Processing Division here. The algorithm management memories 82 are some data modules 44, and are memories the table number of the table to be used is indicated to be in the turn that Image Processing Division is performed.
[0068]And the Image Processing Division code corresponding to the table number is obtained by referring to the image processing memory 84 of the table number. When the Image Processing Division code is not set, it is judged that the Image Processing Division is unregistered. In this Image Processing Division code, Image Processing Division is specified and Image Processing Division is performed based on the parameter stored following on the Image Processing Division code. The entry (effective address) of the actual Image Processing Division task corresponding to the Image Processing Division code is obtained by searching the Image Processing Division code table 86. Thus, Image Processing Division shown with the table number is performed in order of a schedule. It cannot be overemphasized that the number of this Image Processing Division is equal to the number of a use table.
[0069]In processing of the dashed line shown by ** in drawing 5, only the number of Measurement Division screens performs characteristic quantity Measurement Division processing during a schedule with reference to the algorithm management memory of a characteristic quantity algorithm number. Here, especially a characteristic quantity algorithm means the image recognition algorithm which measures characteristic quantity.
[0070]The image recognition program in this invention contains not only the image recognition algorithm mentioned above in this example but this characteristic quantity algorithm. In a characteristic quantity algorithm, a work is recognized by measuring characteristic quantity.
[0071]This characteristic quantity algorithm is also constituted so that two or more predetermined Image Processing Division tasks may be called, and predetermined Image Processing Division is performed. The algorithm management memory corresponding to a characteristic quantity algorithm is called the Measurement Division characteristic quantity management memory 88 especially in this example.
[0072]First, processing is started from the Measurement Division screen number "1", and only the number of algorithm tables (number of the table used with an algorithm) performs Image Processing Division shown in the table number, and extracts a work (recognition). It performs specifying Image Processing Division corresponding to it like the explanation of ** mentioned above from a table number.
[0073]In execution of a characteristic quantity algorithm, the characteristic quantity shown in the characteristic quantity code memorized by the Measurement Division characteristic quantity management memory 88 is measured. Only the number of times with Measurement Division of characteristic quantity equal to the number in which this characteristic quantity code is stored is performed. Specifying a characteristic quantity command (Image Processing Division) is performed by searching the characteristic quantity code table 90 from each characteristic quantity code.
[0074]In processing of the dashed line shown by ** in drawing 5, the measured characteristic quantity is the same turn as the order (characteristic quantity numerical order) of a schedule currently recorded on the Measurement Division characteristic quantity management memory 88, and is set to the Measurement Division data memory 92. This Measurement Division data memory 92 as well as other memories is some data modules 44.
[0075]Thus, in this example, data is exchanged via the data module 44.
[0076]1.2 Explanation of the method of picturizing a work is also included in picturizing method drawing 3 of the work. For every environment where each work and a work are placed, the

Lighting Sub-Division illumination, a binary level, and the optimal image pick-up conditions of a diaphragm are tested beforehand, and are checked. Thus, the data of the Lighting Sub-Division illumination etc. which were obtained is memorized in the database for every work. This database is built on the hard disk in the wrong/missing part recognition host 22.

[0077]The wrong/missing part recognition host 22 by searching said database from the work information included in the production instruction information sent out from ALC24, and the attachment ring boundary information on this work (a color, spec., mold), The optimal image pick-up conditions, such as illumination corresponding to this work, a diaphragm, and a binary level, can be searched for. These optimal image pick-up conditions are sent out to the image recognition device 10, as mentioned above. And illumination and a diaphragm value are changed into a pressure value from the image recognition device 10 by D/A conversion with the illumination control interface 30 or the automatic diaphragm interface 28. Thus, a diaphragm and illumination are controlled by the changed pressure value.

[0078]Thus, the image pick-up conditions corresponding to each work are set up. Since the diaphragm was adjusted in the conventional automatic diaphragm so that the luminosity of a screen might become fixed, there was a possibility of having changed a diaphragm by disturbance light and changing the image pick-up conditions over the work which is a recognition object, but. Since image pick-up conditions are fixed with a work according to this example (an operator is able to change), there is no possibility of changing by disturbance light. Since image pick-up conditions can be beforehand set up before image recognition based on production instruction information according to this example, processing-image-recognition time does not become long for waiting time until a diaphragm is stabilized. Since resolution falls when extracting too much, but image pick-up conditions would not be set up only by diaphragm but illumination will also be doubled and controlled by this example if image pick-up conditions are controlled only by diaphragm, resolution is able to prevent from falling.

[0079]2. As beyond explanation of operation of a wrong/missing part recognition system stated, two or more algorithms corresponding to each work, and each work and the image pick-up conditions for every attachment ring boundary of the are memorized by the wrong/missing part recognition host 22 as a database. Hereafter, explanation of operation of a wrong/missing part recognition system is explained based on the flow chart shown in drawing 6.

[0080]If production instruction information (a color, a mold, etc.) is sent out (step ST5-1), based on production instruction information, the wrong/missing part recognition host 22 will search said database, and will acquire directions information (an algorithm number, illumination, a diaphragm, a binary level) from ALC. And the wrong/missing part recognition host 22 sends out this directions information to the image recognition device 10.

[0081]In the image recognition device 10, in advance of image recognition, as mentioned above, setting out of image pick-up conditions is performed beforehand (step ST5-2). The wrong/missing part recognition host 22 controls the camera switcher 16, and makes the video signals VIN1-VIN4 from the desired cameras 12a-12d, and the synchronized signals SYN1-SYN4 input into the image recognition device 10 (step ST5-3). If it is detected that the work which is a recognition object reached the specified position after image pick-up conditions are set up, the wrong/missing part recognition host 22 sends out a recognition start signal to the image recognition device 10 (step ST5-4, step ST5-5, and step ST5-6). It is detected by a limit switch etc. that the work reached the specified position.

[0082]If a recognition start signal is received, according to the image recognition algorithm mentioned above, the image recognition device 10 will perform Image Processing Division, and will recognize a work (step ST5-7). It being characteristic in this example is being able to choose from a menu Image Processing Division, such as each "binary-izing" etc. which the image recognition algorithm used for recognition of this work includes.

[0083]The image recognition device 10 returns the wrong/missing part recognition host 22 the decision result, after finishing recognition and collation processing (step ST5-8). If a collated result is a right thing, the wrong/missing part recognition host 22 returns a jig to an original position, and sends out said collated result to the good wrong/missing part recognition host 22. On the other hand, if the above-mentioned collated result apologizes, clamping a work with a jig,

the revolving light of the factory line and a buzzer will be operated, and it will report to a worker. A worker checks the actual thing, does predetermined repair, and unclamps a work. And the result is automatically sent out from the wrong/missing part recognition host 22 (step ST5-9).
[0084]As stated above, the wrong/missing part recognition system in this example became able [an operator] to build an image recognition algorithm using the menu displayed on the monitor 32 connected to the image recognition device 10.
[0085]Conventionally, although the expert had to perform all coding compile from the beginning, the image recognition algorithm corresponding to a new work, According to this example, when those who do not have a know how also choose various kinds of Image Processing Division on the monitor 32, it can register with an algorithm easily.
[0086]Therefore, the effect that the wrong/missing part recognition system which can respond promptly can be provided also to a new work is acquired.
[0087]
[Effect of the Invention]According to this invention, it becomes possible to build an image recognition algorithm by selection from a menu. Therefore, even if it is not those who became skillful in creation of the program, an image recognition algorithm can be built easily. Of course, even if it is an expert, it cannot be overemphasized as compared with creating [which is an object of recognition] an image recognition algorithm for every work that an image recognition algorithm can be built more easily.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

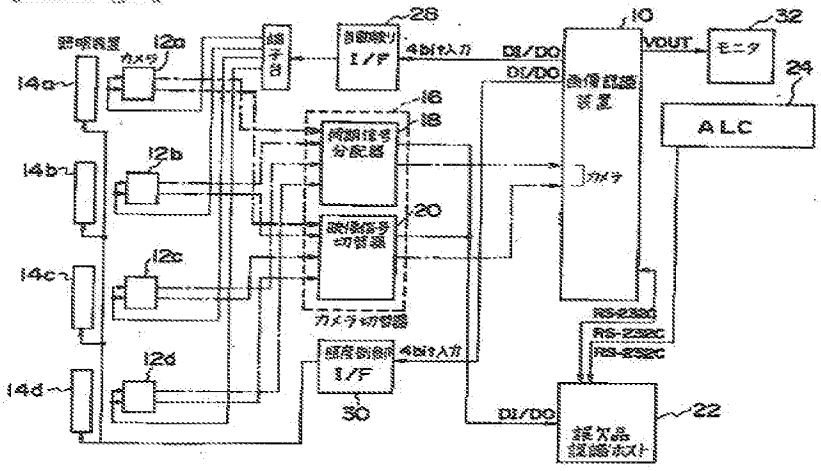
[Brief Description of the Drawings]
[Drawing 1]It is a lineblock diagram of the wrong/missing part recognition system which is suitable working example concerning this invention.
[Drawing 2]It is a lineblock diagram of the software of the image recognition device 10.
[Drawing 3]It is a partial lineblock diagram of the wrong/missing part recognition system centering on the image recognition device 10.
[Drawing 4]It is a lineblock diagram showing only the composition of a means by which an image recognition algorithm is built, within the image recognition device 10.
[Drawing 5]It is an explanatory view explaining detailed operation of the image recognition device 10.
[Drawing 6]It is a flow chart explaining operation of the wrong/missing part recognition system concerning this example.
[Description of Notations]
10 Image recognition device
12 Camera
14 Lighting system
16 Camera switcher
18 Synchronizing pulse distribution unit
20 Video-signal switcher
22 Wrong/missing part recognition host
24 ALC
28 Automatic diaphragm Interface Division
30 Illumination control Interface Division
32 Monitor
33 Menu device
39 Image Processing Division library
40 RS232C driver
44 Data module
48 Operation management task
50 Initialization task
54 DI/DO transmission task
56 DI/DO receiving task
58 Image taking task
60 Image Processing Division task
62 Judgment task
66 RS232C transmission task
80 Schedule management memory
82 Algorithm management memory
84 Image processing memory
86 Image Processing Division code table
88 Measurement Division characteristic quantity management memory

90 Characteristic quantity code table
92 Measurement Division data memory

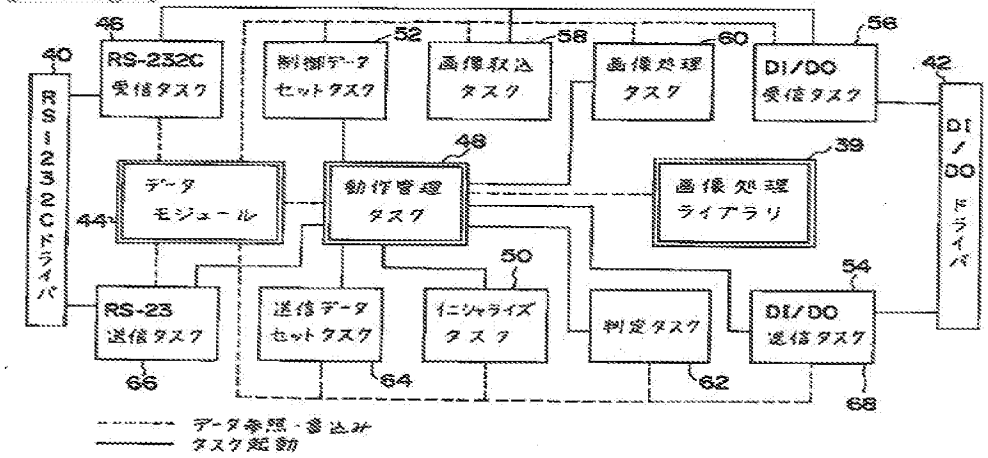
[Translation done.]

DRAWINGS

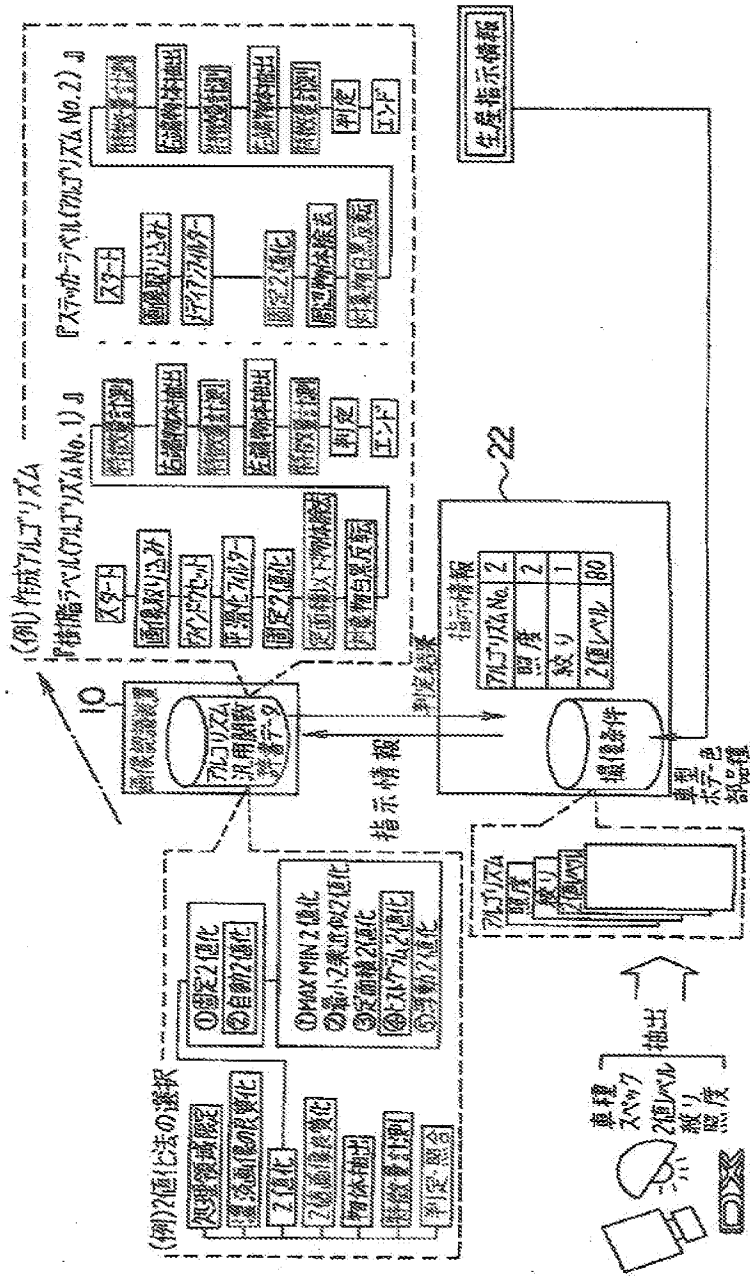
[Drawing 1]



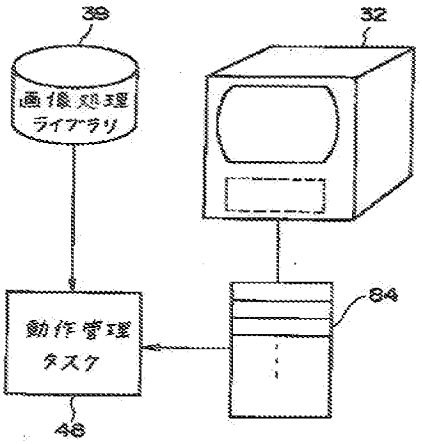
[Drawing 2]



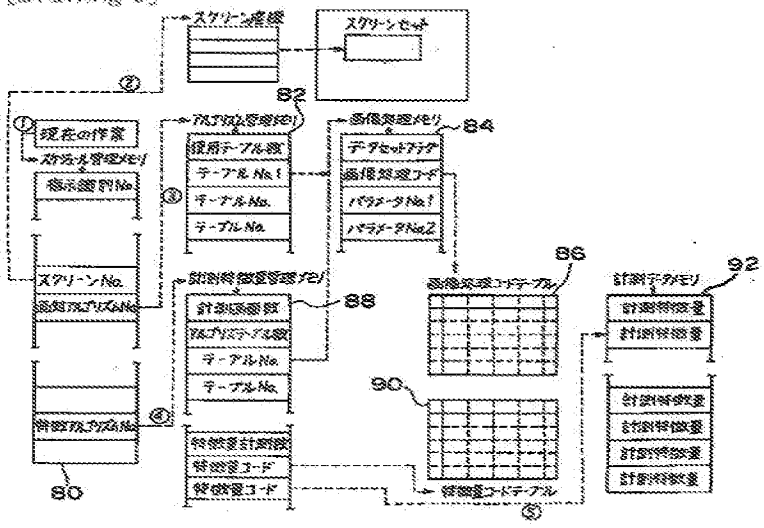
[Drawing 3]



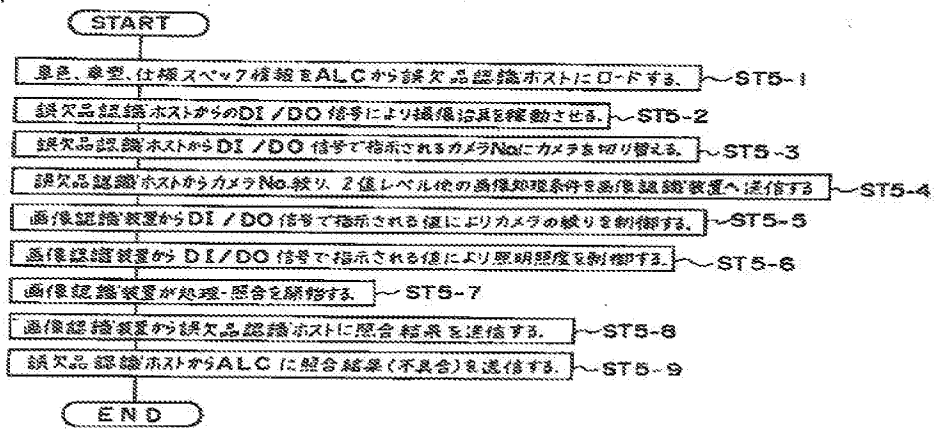
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Translation done.]